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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No. : 10/661,651
Applicant : DAVIS, *et al.*
Filed : SEPTEMBER 12, 2003
Title : CHEMICAL MILLING OF GAS TURBINE ENGINE BLISKS

Art Unit : 1763
Examiner : CULBERT, ROBERT P.

Atty Docket No. : 13DV13813-5

Mail Stop: Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

The below-identified communication(s) is (are) submitted in the above-captioned application or proceeding:

- ☒ Appeal Brief
- ☒ Fee Transmittal and Authorization to Charge Deposit Account
- ☒ The Commissioner is hereby authorized to charge payment of any fees associated with this communication, including fees under 37 C.F.R. §§ 1.16 and 1.17 or credit any overpayment to **Deposit Account Number 10-0233-GEAE-0024-CP1.**

Respectfully submitted,

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May 19, 2006



Patent Fee Transmittal for FY 2006

☐ Applicant(s) Claims Small Entity Status 37 C.F.R. 1.27

TOTAL AMOUNT OF PAYMENT

\$500.00

Application No. 10/661,651
Filing Date 12-Sep-03
Named Inventor DAVIS, et al.
Examiner Name CULBERT, Roberts P.
Art Unit 1763
Attorney Docket No. 13DV13813-5

FEE CALCULATION

1. Filing Fees

Application Type	Description	Large Entity		Small Entity		Paid
		Code	(\$)	Code	(\$)	
Utility	Basic	1011	300	2011	150	\$ -
	Examination	1311	200	2311	100	\$ -
	Search	1111	500	2111	250	\$ -
Design	Basic	1012	200	2012	100	\$ -
	Examination	1312	130	2312	65	\$ -
	Search	1112	100	2112	50	\$ -
Plant	Basic	1013	200	2013	100	\$ -
	Examination	1313	160	2313	80	\$ -
	Search	1113	300	2113	150	\$ -
Reissue	Basic	1014	300	2014	150	\$ -
	Examination	1114	600	2114	300	\$ -
	Search	1314	500	2314	250	\$ -
Provisional	Basic	1005	200	2005	100	\$ -
National Stage	Basic	1631	300	2631	150	\$ -
	Examination	1633	200	2633	100	\$ -
	Search	1632	500	2632	250	\$ -

2. Extra Claim Fee

a. Claims as Filed

		Large Entity		Small Entity		Paid
		Code	(\$)	Code	(\$)	
Total Claims	0 - 20 = 0	1201	50	2201	25	\$ -
Independent	0 - 3 = 0	1202	200	2202	100	\$ -
Multiple Dependent		1203	360	2203	180	\$ -

b. Claims as Amended

		Large Entity		Small Entity		Paid
		Code	(\$)	Code	(\$)	
Total Claims	0 - 0 * = 0	1201	50	2201	25	\$ -
Independent	0 - 0 ** = 0	1202	200	2202	100	\$ -
First Presentation of Multiple Dependent		1203	360	2203	180	\$ -

* Less than 20, enter 20 ** Less than 3, enter 3

3. Extra Page Fee

		Large Entity		Small Entity		Paid
		Code	(\$)	Code	(\$)	
Total Pages	0 - 100 = 0	1081	250	2081	125	\$ -

Subtotal for Application Fees

1 \$ - + 2 \$ - + 3 \$ - = \$ -

4. Additional Fees

Description	Large Entity		Small Entity		Paid
	Code	(\$)	Code	(\$)	
Extension for response first month	1251	120	2251	60	\$ -
Extension for response second month	1252	450	2252	225	\$ -
Extension for response third month	1253	1,020	2253	510	\$ -
Extension for response fourth month	1254	1,590	2254	795	\$ -
Extension for response fifth month	1255	2,160	2255	1,080	\$ -
Notice of Appeal	1401	500	2401	250	\$ -
Filing a Brief in Support of an Appeal	1402	500	2402	250	\$ 500
Request for Oral hearing	1403	1,000	2403	500	\$ -
Petitions under 1.17(f)	1462	400	1462	400	\$ -
Petitions under 1.17(g)	1463	200	1463	200	\$ -
Petitions under 1.17(h)	1464	130	1464	130	\$ -
Petition - public use proceeding	1451	1,510	1451	1,510	\$ -
Petition to Revive - Unavoidable	1452	500	2452	250	\$ -
Petition to Revive - Unintentional	1453	1,500	2453	750	\$ -
Utility Issue Fee	1501	1,400	2501	700	\$ -
Design Issue Fee	1502	800	2502	400	\$ -
Plant Issue Fee	1503	1,100	2503	550	\$ -
Reissue Issue Fee	1511	1,400	2511	700	\$ -
Publication Fee	1504	300	1504	300	\$ -
Statutory Disclaimer	1814	130	2814	65	\$ -

(cont.)

Description (cont.)

Description (cont.)	Large Entity		Small Entity		Paid
	Code	(\$)	Code	(\$)	
Recording each Assignment	8021	40	8021	40	\$ -
Submission of IDS	1806	180	1806	180	\$ -
Request for Cont. Examination (RCE)	1801	790	2801	395	\$ -
Filing Submission After Final	1809	790	2809	395	\$ -
Surcharge - late filing fee or oath	1051	130	2051	65	\$ -
Surcharge - late provisional fee	1052	50	2052	25	\$ -
Non-English Specification	1053	130	1053	130	\$ -
Processing Fee 37 CFR 1.17(q)	1807	50	1807	50	\$ -
Request for Ex Parte Reexamination	1812	2,520	1812	2,520	\$ -
Request Pub. of SIR prior to action	1804	920	1804	920	\$ -
Request Pub. of SIR after action	1805	1,840	1805	1,840	\$ -
Each Add. Invention Examined	1810	790	2810	395	\$ -
Expedited Examination (Design)	1802	900	1802	900	\$ -
Unintentionally Delayed Priority Claim	1453	1,370	1453	1,370	\$ -
Certificate of Correction	1811	100	1811	100	\$ -
Maintenance Fees 3.5 years	1551	900	2551	450	\$ -
Maintenance Fees 7.5 years	1552	2,300	2552	1,150	\$ -
Maintenance Fees 11.5 years	1553	3,800	2553	1,900	\$ -
Surcharge - Late Payment 6 mos.	1554	130	2554	65	\$ -
Other fee					\$ -

Additional Fee Subtotal 4 \$ 500

METHOD OF PAYMENT (Check all that apply)

☒ Credit Card (Provide credit card information and authorization on PTO-2038)

☒ Deposit Account No.

10-0233-GEAE-0024-CP1

For the above-identified deposit account, the Director is hereby authorized to:

☐ To charge the above-identified fee.

☒ To charge any additional fees which may be required under 37 CFR 1.16, 1.17, 1.18, 1.20 and 1.492 or credit any overpayment to the deposit account number listed above.

Submitted by:

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Signature

May 19, 2006

Date



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application No. : 10/661,651
Applicant : BRIAN MICHAEL DAVIS ET AL.
Filed : SEPTEMBER 12, 2003
Title : CHEMICAL MILLING OF GAS TURBINE ENGINE BLISKS

Art Unit : 1763
Examiner : ROBERT P. CULBERT

Atty Docket No. : 13DV13813-5

Mail Stop: Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPELLANTS BRIEF

Sir:

This is an appeal of Claims 1-20 currently pending in the above application that were rejected by the Examiner in an Office Action (made FINAL) dated January 17, 2006. A timely Notice of Appeal was submitted by Appellants to the Patent and Trademark Office on March 21, 2006. Appellants Brief is being timely submitted herewith in support of their appeal to the Board of Appeals and Patent Interferences (Board), together with the requisite fee of \$500.00.

REAL PARTY IN INTEREST

The real party in interest is The General Electric Company, the assignee of the above application.

RELATED APPEALS AND INTERFERENCES

There are currently no appeals or interferences known to Appellants, Appellants' legal representative, or the assignee that will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

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Application No.: 10/661,651
Attorney Docket No. 13DV13813-5



STATUS OF CLAIMS

Claims 1-20 are currently pending and are the only rejected claims on appeal. A clean copy of Claims 1-20 on appeal appears in the attached Claims Appendix.

STATUS OF AMENDMENTS

No amendment was filed by Appellants pursuant to 37 CFR 1.116(b) in response to the Final Office Action dated January 17, 2006.

SUMMARY OF THE INVENTION

Appellants' claimed invention relates to a method for selective chemical milling of a rotationally imbalanced gas turbine engine blisk 10 having a hub 14 and a plurality of metal blades 18 spaced circumferentially around hub 14 and extending radially outwardly therefrom, wherein at least one blade 18 is selectively treated with a chemical etchant for a period of time sufficient to change at least one of the chord 46 or thickness 50 so that blisk 10 is rotationally balanced (see, for example, Claims 1 and 9). See paragraphs [0010], [0019]-[0021], and [0023]-[0025] at pages 4 and 6-9 of the above application, as well as FIGS. 1-3 and 5 of the drawings. Prior to selective treatment with the chemical etchant, the rotationally imbalanced blisk may be evaluated to determine the direction and magnitude of the rotational imbalance, and to identify and determine which blade(s) 18 is to be treated with the chemical etchant to correct the rotational imbalance of the blisk (see Claim 9); if the blisk is determined not to be rotationally balanced after treatment, the evaluation, identification and determination steps may be repeated (see Claim 10). See paragraphs [0011] and [0023]-[0024] at pages 4-5 and 8-9 of the above application, and steps 101-103 and 105-106 of FIG. 5.

The chemical etchant may be an aqueous etchant solution comprising at least one strong acid such hydrofluoric acid, nitric acid, hydrochloric acid, or sulfuric acid (see Claims 2-4 and 11-13). See paragraph [0026] at pages 10-11 of the above application. The selective treatment step may comprise immersing blades 18 (see blades 118-518 of FIG. 3) in the etchant solution 64 where blade(s) 18 not to be treated are provided prior to treatment with a chemically resistant maskant applied to the surface, with optional removal of the maskant to subsequently treat the untreated

blade(s) 18 with the etchant solution 64 (see Claims 5-7 and 14-16). Alternatively, only blade(s) 18 to be treated are selectively immersed in the etchant solution until the blisk is rotationally balanced (see Claim 17). See paragraphs [0029]-[0030] and [0034] at pages 12-14 of the above application. A reference panel 64 may be used to monitor the degree of change in the chord 46/thickness 50 of blade 18 and the degree of hydrogen absorption by the metal of blade(s) 18 (see Claim 8 and 18-20). See paragraphs [0031]-[0032] at pages 13-14 of the above application, and FIG. 3.

GROUND OF REJECTION TO BE REVIEWED ON APPEAL

There are four grounds of rejection to be reviewed on this appeal. The first ground of rejection is whether Claims 1 and 9-10 are unpatentable under 35 U.S.C. § 103(a) over the alleged “admitted prior art” (hereafter referred to as “APA”) at paragraphs [0002]-[0006] of the above application, or alternatively over U.S. Patent 6,077,002 (hereafter referred to as “Lowe”), in view of Walker, *Machining Fundamentals* (hereafter referred to as “Walker”). The second ground of rejection is whether Claims 2-4 and 11-13 are unpatentable under 35 U.S.C. § 103(a) over the alleged APA, or alternatively over Lowe, in view of Walker, and further in view of U.S. Patent 4,534,823 (hereafter referred to as “Fishter et al.”). The third ground of rejection is whether Claims 5-7 and 14-17 are unpatentable under 35 U.S.C. § 103(a) over the alleged APA, or alternatively over Lowe, in view of Walker, in view of Fishter et al., and further in view of U.S. Patent 5,126,005 (hereafter referred to as “Blake”). The fourth ground of rejection is whether Claims 8 and 18-20 are unpatentable under 35 U.S.C. § 103(a) over the alleged APA, or alternatively over Lowe, in view of Walker, in view of Fishter et al., and further in view of U.S. Patent 5,259,920 (hereafter referred to as “Law”).

ARGUMENT

A. REJECTION OF CLAIMS 1 AND 9-10 UNDER 35 USC § 103(a) AS UNPATENTABLE OVER ALLEGED APA, OR ALTERNATIVELY OVER LOWE, IN VIEW OF WALKER

In rejecting Claims 1 and 9-10 under 35 U.S.C. § 103(a) as unpatentable over

the alleged APA, or alternatively over Lowe, in view of Walker, the Examiner has erred in the Final Office Action for at least the following five reasons: (1) the alleged APA and Lowe do not teach or suggest treating at least one blade of a rotationally imbalanced blisk with a chemical etchant to provide a rotationally balanced blisk; (2) the alleged APA does not teach or suggest steps (a) through (d) of Claim 9; (3) the alleged APA does not teach or suggest steps (e) or (f) of Claim 10; (4) Walker does not teach or suggest chemical milling of the blades of a rotationally imbalanced blisk to achieve rotational balance of the blisk; and (5) there is no properly alleged motivation for combining the teachings of Walker with either the alleged APA or Lowe.

**1. THE ALLEGED APA AND LOWE DO NOT TEACH OR SUGGEST
TREATING AT LEAST ONE BLADE OF A ROTATIONALLY IMBALANCED
BLISK WITH A CHEMICAL ETCHANT TO PROVIDE A ROTATIONALLY
BALANCED BLISK.**

As conceded in the Final Office Action, neither the alleged APA, nor Lowe, teach treating at least one blade of a blisk with a chemical etchant. As taught in the above application (see paragraph [0004] at pages 1-2), blisks are typically manufactured from a one-piece solid forging which is conventionally machined using either mechanical machining (mechanical milling) or electrochemical machining (ECM). See also Lowe (column 1, lines 46-59 and column 2, lines 27-33) which describes conventional mechanical milling and ECM methods for making such blisks. Indeed, the conventional mechanical milling and ECM methods described in the alleged APA, as well as Lowe, create rotationally imbalanced blisks. By contrast, the method of Claims 1 and 9-10 selectively treats the blades of a rotationally imbalanced blisk with the chemical etchant to provide a rotationally balanced blisk.

At column 2, lines 49-64, Lowe acknowledges the problem of balancing blisks, and even mentions providing “an annular balancing land near the hub from which material may be precisely machined for balancing the entire blisk” (see lines 54-57). Lowe also points out that the balance correction afforded by this balancing land may not be sufficient and that “individual airfoils may require additional milling provided sufficient material remains thereon in order to reduce the initial imbalanced

condition of the blisk” (see lines 58-64). But the only milling method taught or even suggested Lowe to reduce the initial imbalanced condition of the blisk uses a “rotating mill,” i.e., a mechanical milling method (see column 3, lines 1-9). Nowhere does Lowe teach or suggest that balancing of a blisk may be achieved by selectively treating the blades thereof with a chemical etchant according to Claims 1 and 9-10.

2. THE ALLEGED APA DOES NOT TEACH OR SUGGEST STEPS (a) THROUGH (d) OF CLAIM 9.

In rejecting Claim 9, the Final Office Action refers to and relies on the alleged APA at paragraphs [0005]-[0006] of the above application to teach steps (a) through (d). Such reliance is misplaced. Nowhere does paragraphs [0005]-[0006] of the above application use wording that is the same or similar to that of steps (a) through (d) in Claim 9. Nor does the Final Office Action specifically explained, as required by 37 CFR 1.104(c)(2), how what is described in paragraphs [0005]-[0006] of the above application is the equivalent of any or all of steps (a) through (d) of Claim 9. In summary, the Final Office Action has alleged no supportable basis the alleged APA for rejecting Claim 9.

3. THE ALLEGED APA DOES NOT TEACH OR SUGGEST STEPS (e) OR (f) OF CLAIM 10.

In rejecting Claim 10, the Final Office Action concedes that the alleged APA, even in view of Walker, does not teach steps (e) or (f). Instead, page 5 of the Final Office Action makes the unsupported conclusory statement that it would be obvious “to repeat the process in order to determine that the blisk is balanced.” Such a conclusory statement having no basis in the art relied on is a thoroughly improper reason for rejecting Claim 9, and is contrary to the requirements of 37 CFR 1.104(c)(2). In summary, the Final Office Action has alleged no supportable basis for rejecting Claim 10.

4. WALKER DOES NOT TEACH OR SUGGEST CHEMICAL MILLING OF THE BLADES OF A ROTATIONALLY IMBALANCED BLISK TO ACHIEVE ROTATIONAL BALANCE OF THE BLISK.

Page 5 of the Final Office Action alleges that, based on page 512, first full paragraph of the left column, of Walker, “it is old in the machining art to use chemical

etching to remove material from a contoured or shaped metal part,” and that Walker teaches chemical etching is a “conventional complementary milling [process] to form parts having more exact dimensions.” In view of Walker, the Final Office Action further alleges that it would have been obvious to modify the process of Lowe or the alleged APA to include chemical etching (milling) “in order to provide exact dimensions for the blisk, thereby reducing blade-to-blade variations and improving the balance of the blisk.”

What the Final Office Action alleges about Walker represents a complete misunderstanding of what is needed to solve the problem of rotationally imbalanced blisks. Walker teaches the use of chemical milling to machine metal parts “to exacting tolerances.” See page 511, right hand column, second paragraph. Achieving “exacting tolerances” is not what is important in creating rotationally balanced blisks. Put differently, blades having “exacting tolerances” relative to each other is neither a necessary, nor sufficient, condition to achieve blisk balance. For example, the blades of the blisk could be exactly the same (i.e., no blade-to-blade variation), but offset from the blisk centerline, thus making the blisk unbalanced.

Unlike what Walker teaches, it is not the purpose of the claimed method to make “exact” blades within the blisk, but instead to alter the blade (or blades) of the blisk as required to change the blisk from an unbalanced to a balanced configuration. Put differently, to correct the rotational balance problem of blisks, the dimensional characteristics (i.e., the chord and/or thickness) of one or more blades are changed (and thus the mass of the blade(s)) to achieve balance of the blisk about its rotational center. That is what chemical milling according to Claims 1 and 9-10 accomplishes by adjusting the chord and/or thickness of the blisk blades. See paragraph [0012] at page 5 of above application. In other words, what the method of Claims 1 and 9-10 does is to change the mass distribution of the blades to create a balanced blisk, even if the blades are not within “exacting tolerances.”

5. THERE IS NO PROPERLY ALLEGED MOTIVATION FOR COMBINING THE TEACHINGS OF WALKER WITH EITHER THE ALLEGED APA OR LOWE.

The Final Office Action also improperly combines the teachings of Walker with those of the alleged APA and Lowe. To properly combine the teachings of

Walker with those of the alleged APA and Lowe, the Final Office Action must allege some proper motivation for one skilled in the art to do so. *See, e.g., In re Fine*, 837 F.2d 1071, 1075, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988) (“teachings of references can be combined only if there is some suggestion or incentive to do so”); *In re Dance*, 160 F.3d 1339, 1343, 48 U.S.P.Q.2d 1635, 1637 (Fed. Cir. 1998) (there must be some motivation, suggestion, or teaching of the desirability of making the specific combination that was made by the applicant).

The Final Office Action alleges no proper “motivation to combine” Walker with the alleged APA and Lowe. First, the Final Office Action alleges no “motivation” in the alleged APA or Lowe for why one skilled in the art would consider the teachings of Walker to be relevant. In other words, the Final Office Action is considering the combination of Walker with the alleged APA and Lowe backwards relative to the proper legal standard for “motivation to combine.”

Moreover, relative to the process disclosed in Walker for achieving “exacting tolerances,” the chemical milling process of Claims 1 and 9-10 is, instead, a different process, i.e., one that changes the mass distribution of the blades to correct the rotational balance of the blisk. Again, the Final Office Action’s suggestion that forming a blisk to “more exact dimensions” to “reduce blade-to-blade variation” will necessarily lead to “improving the balance of the blisk” is incorrect, and finds no support in Walker, or any of the other art relied on by the Final Office Action. In fact, nowhere does Walker teach that chemical milling can be used to achieve rotational balance of any part, much less a blisk.

That Walker is not directed at correcting rotational imbalances in blisks is further demonstrated by what applications of chemical milling are specifically exemplified in this reference. In Figure 28-2, Walker exemplifies the use of chemical milling for etching the outer skin of an aircraft engine housing, not a gas turbine blade such as a blisk blade. In Figure 28-3, Walker exemplifies the use of chemical milling in making multiple depth cuts, not in adjusting the dimensions of a formed part such as a blisk blade. In fact, all that Walker specifically exemplifies is the use of chemical milling with static non-rotating components which, unlike a blisk, do not require rotational balancing for successful operation. There is simply nothing specifically

exemplified in Walker that would motivate one skilled in the art to apply chemical milling to the problem of adjusting the dimensions (i.e., the chord and/or thickness) of blisk blades according to the process of Claims 1 and 9-10 to correct rotational imbalances in such blisks.

B. REJECTION OF CLAIMS 2-4 AND 11-13 UNDER 35 USC § 103(a) AS UNPATENTABLE OVER ALLEGED APA, OR ALTERNATIVELY OVER LOWE, IN VIEW OF WALKER, AND FURTHER IN VIEW OF FISHTER ET AL.

In rejecting Claims 2-4 and 11-13 under 35 USC § 103(a) as unpatentable over the alleged APA, or alternatively over Lowe, in view of Walker, and further in view of Fishter et al, the Examiner in the Final Office Action has erred for at least the following two reasons: (1) no motivation is alleged based on Walker, the alleged APA or Lowe for why one skilled in the art would consider the teachings of Fishter et al. to be relevant; and (2) there is no proper motivation taught in Fishter et al. for combining the teachings of this reference with those Walker, the alleged APA and Lowe.

1. NO PROPER MOTIVATION IS ALLEGED BASED ON WALKER, THE ALLEGED APA OR LOWE FOR WHY ONE SKILLED IN THE ART WOULD CONSIDER THE TEACHINGS OF FISHTER ET AL. TO BE RELEVANT.

Page 5 of the Final Office Action concedes that the alleged APA, Lowe and Walker fail to teach a chemical etchant that is an aqueous etchant solution comprising at least one acid selected from hydrofluoric acid, nitric acid, or sulfuric acid according to Claims 2-4 and 11-13. Instead, the Final Office Action refers to column 2, lines 14-16 of Fishter et al. to teach that solutions for etching gas turbine superalloys include solutions containing hydrochloric and nitric acid. In view of Fishter et al, the Final Office Action alleges it would have been obvious to use a chemical solution containing the acids listed in Claims 2-4 and 11-13 “since the same were known at the time of [the] invention to be suitable for etching superalloy gas turbine materials.”

The Final Office Action has improperly combined the teachings of Fishter et al. with those of Walker, the alleged APA and Lowe by failing to allege some proper motivation for one skilled in the art to do so. To properly combine the teachings of

Fishter et al. with those of the alleged APA, Lowe and Walker, the Final Office Action must allege some proper motivation for one skilled in the art to do so. *See, e.g., In re Fine*, 837 F.2d 1071, 1075, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988) (“teachings of references can be combined only if there is some suggestion or incentive to do so”); *In re Dance*, 160 F.3d 1339, 1343, 48 U.S.P.Q.2d 1635, 1637 (Fed. Cir. 1998) (there must be some motivation, suggestion, or teaching of the desirability of making the specific combination that was made by the applicant). Instead, the Final Office Action alleges no “motivation” based on Walker, the alleged APA or Lowe for why one skilled in the art would consider the teachings of Fishter et al. to be relevant.

2. THERE IS NO PROPER MOTIVATION TAUGHT IN FISHTER ET AL. FOR COMBINING THE TEACHINGS OF THIS REFERENCE WITH THOSE OF WALKER, THE ALLEGED APA AND LOWE.

In addition, there is no proper motivation taught in Fishter et al. for combining the teachings of this reference with those Walker, the alleged APA and Lowe according to the method of Claims 2-4 and 11-13. Fishter et al. only teaches the use of chemical milling with chemical etchant acids to remove a surface layer from a machined article as part of an inspection process for surface defects. See column 1, lines 7-9, and column 2, lines 24-28.

In fact, chemical milling according to Fishter et al. is for the express purpose of not adversely affecting (at least metallurgically) the part being inspected. See column 1, lines 59-65. Accordingly, what Fishter et al. says about chemical etchant acids is simply inadequate to teach or suggest chemical milling with chemical etchant acids, even in aqueous etchant solutions, to adjust the dimensions (i.e., the chord and/or thickness) of blisk blades according to the process of Claims 2-4 and 11-13 to correct rotational imbalances in such blisks.

C. REJECTION OF CLAIMS 5-7 AND 14-17 UNDER 35 USC §103(a) AS UNPATENTABLE OVER ALLEGED APA, OR ALTERNATIVELY OVER LOWE, IN VIEW OF WALKER, IN VIEW OF FISHTER ET AL., AND FURTHER IN VIEW OF BLAKE

In rejecting Claims 5-7 and 14-17 under 35 USC § 103(a) as unpatentable over the alleged APA, or alternatively over Lowe, in view of Walker, in view of Fishter et al., and further in view of Blake, the Examiner in the Final Office Action has erred for at least the following four reasons: (1) no proper motivation has been alleged based on Fishter et al., Walker, the alleged APA or Lowe for why the teachings of Blake would be considered relevant; (2); Blake does not teach or suggest selective application of a maskant to some of the blisk blades prior to immersion in the etchant solution, and especially for the purpose of correcting the rotational imbalance of a blisk; (3) Blake does not teach or suggest removing the maskant from the untreated blisk blade and then reimmersing the treated and untreated blades in the etchant solution until the blisk is rotationally balanced according to Claims 7 and 16; and (4) nowhere is it alleged where the combination of Blake, Fishter et al., Walker, the alleged APA or Lowe teaches or suggest immersing solely the treated blade(s) in the etchant solution to achieve rotational balance of the blisk according to Claim 17.

1. NO PROPER MOTIVATION IS ALLEGED BASED ON FISHTER ET AL., WALKER, THE ALLEGED APA OR LOWE FOR WHY ONE SKILLED IN THE ART WOULD CONSIDER THE TEACHINGS OF BLAKE TO BE RELEVANT.

Page 6 of the Final Office Action concedes that the alleged APA, Lowe, Walker and Fishter et al. fail to teach immersing at least two blades of the blisk in the etchant solution, where at least one blade is to be treated with the solution, and where at least one blade is not to be treated with the solution, by applying (prior to immersion) to the surfaces of the blade(s) not to be treated a maskant that is chemically resistant to the solution according to Claims 5-7 and 14-17. Instead, the Final Office Action relies on Blake to allegedly teach that a plastic film may be applied prior to immersion in a chemical solution in order protect regions of a metal part in which chemical milling is not desired (referring to column 2, lines 7-50), and to allegedly teach that it is known to remove the maskant and repeat the etching process (referring to column 1, lines 30-44). In view of Blake, the Final Office Action alleges that it would have been obvious to modify the process of the alleged APA or Lowe (in view of Fishter et al.) to immerse at least two blades in the solution

and to selectively mask areas of the turbine blades “because this will allow for etching selected portions of the blades without having to move the blisk thus decreasing processing time.” The Final Office Action also alleges that it would have been obvious to remove the maskant and repeat the etching process in order to remove material from the desired portions of the blades, “thereby balancing the blisk through the etching process.”

The Final Office Action has improperly combined the teachings of Blake with those of Fishter et al., Walker, the alleged APA and Lowe by failing to allege some proper motivation for one skilled in the art to do so. To properly combine the teachings of Blake with those of the alleged APA, Lowe, Walker and Fishter et al., the Final Office Action must allege some proper motivation for one skilled in the art to do so. *See, e.g., In re Fine*, 837 F.2d 1071, 1075, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988) (“teachings of references can be combined only if there is some suggestion or incentive to do so”); *In re Dance*, 160 F.3d 1339, 1343, 48 U.S.P.Q.2d 1635, 1637 (Fed. Cir. 1998) (there must be some motivation, suggestion, or teaching of the desirability of making the specific combination that was made by the applicant). Instead, the Final Office Action alleges no proper “motivation” based on Fishter et al., Walker, the alleged APA, or Lowe for why one skilled in the art would consider the teachings of Blake to be relevant.

2. BLAKE DOES NOT TEACH OR SUGGEST SELECTIVE APPLICATION OF A MASKANT TO SOME OF THE BLISK BLADES PRIOR TO IMMERSION IN THE ETCHANT SOLUTION, AND ESPECIALLY FOR THE PURPOSE OF CORRECTING THE ROTATIONAL IMBALANCE OF A BLISK.

In addition, Blake does not teach or suggest selective application of the maskant to some of the blisk blades prior to immersion in the etchant solution according to Claims 5-7 and 14-17. Instead, what Blake teaches is: (a) applying the maskant to one or more surfaces of an airplane skin; and (b) removing the maskant from selected areas that are to be etched by chemical milling. See column 2, lines 9-19. In other words, Blake does not teach or suggest selectively masking distinct parts of the component (e.g., blades of a blisk) for etching by chemical milling. In particular, Blake does not teach or suggest selective application of the maskant to

distinct parts of the component to be etched by chemical milling for the purpose of balancing the component, i.e., correcting the rotational imbalance of a blisk according to Claims 5-7 and 14-17.

3. BLAKE DOES NOT TEACH OR SUGGEST REMOVING THE MASKANT FROM AN UNTREATED BLISK BLADE AND THEN REIMMERSING THE TREATED AND UNTREATED BLISK BLADES IN THE ETCHANT SOLUTION UNTIL THE BLISK IS ROTATIONALLY BALANCED ACCORDING TO CLAIMS 7 AND 16.

The method of Claims 7 and 16 involves removing the maskant from the untreated blisk blade(s) and then reimmersing the treated and untreated blisk blades in the etchant solution until the blisk is rotationally balanced. Pages 6-7 of the Final Office Action allege that removal of the maskant and repeating the etching process would be obvious “in order to remove material from the desired portions of the blades, thereby balancing the blisk through the etching process.” But column 1, lines 30-44 of Blake which is relied on by the Final Office Action to teach removing the maskant and repeating the etching process comes from the Background section. In fact, the cited prior art process consisting of a plurality of masking, removal and etching steps is considered by Blake not to provide sufficient benefits. See column 1, lines 40-44. In other words, Blake in no way teaches or suggests such reimmersion after removal of the maskant is desirable. In particular, Blake would not suggest removing the maskant from the untreated blisk blade(s) and then reimmersing the treated and untreated blisk blades in the etchant solution until the blisk is rotationally balanced according to Claims 7 or 16.

4. NOWHERE IS IT ALLEGED WHERE THE COMBINATION OF BLAKE, FISHTER ET AL., WALKER, THE ALLEGED APA OR LOWE TEACHES OR SUGGESTS IMMERSING SOLELY THE TREATED BLADE(S) IN THE ETCHANT SOLUTION TO ACHIEVE ROTATIONAL BALANCE OF THE BLISK ACCORDING TO CLAIM 17.

The method of Claim 17 involves immersing solely the treated blade(s) in the etchant solution to until the blisk is rotationally balanced. Nowhere does the Final Office Action allege where the combination of Blake, Fishter et al., Walker, the

alleged APA or Lowe teaches or suggest immersing solely the treated blade(s) in the etchant solution to achieve rotational balance of the blisk according to Claim 17.

D. REJECTION OF CLAIMS 8 AND 18-20 UNDER 35 USC § 103(a) AS UNPATENTABLE OVER ALLEGED APA, OR ALTERNATIVELY OVER LOWE, IN VIEW OF WALKER, IN VIEW OF FISHTER ET AL., AND FURTHER IN VIEW OF LAW

In rejecting Claims 8 and 18-20 under 35 USC § 103(a) as unpatentable over the alleged APA, or alternatively over Lowe, in view of Walker, in view of Fishter et al., and further in view of Law, the Examiner in the Final Office Action has erred for at least the following three reasons: (1) no proper motivation has been alleged based on Fishter et al., Walker, the alleged APA or Lowe for why the teachings of Law would be considered relevant; (2) there is no proper motivation taught in Law for combining the teachings of this reference with those of Walker, the alleged APA and Lowe; and (3) Law does not teach using a reference panel comprising titanium, steel, nickel, tungsten or alloys thereof according to Claim 19.

1. NO PROPER MOTIVATION HAS BEEN ALLEGED BASED ON FISHTER ET AL., WALKER, THE ALLEGED APA OR LOWE FOR WHY THE TEACHINGS OF LAW WOULD BE CONSIDERED RELEVANT.

Page 7 of the Final Office Actions concedes that the alleged APA, Lowe, Walker and Fishter et al. fail to teach a reference panel made of the same metal as the blade(s) to be treated that is immersed in the solution to monitor the degree of change in the chord and/or thickness of the blade and the degree of hydrogen absorption according to Claims 8 and 18-20. Instead, the Office Action refers to column 1, lines 5-38 of Law to allegedly disclose the use of a reference panel made of the same metal as the blade(s) to monitor the etching rate. In view of Law, the Office Action alleges that it would have been obvious to modify the process of the alleged APA or Lowe (in view of Fishter et al.) to use a reference panel made of the same material as the treated blade “in order to accurately determine the etch rate and thus predict the change in dimensions of the workpiece improving the efficiency of the process.” The Office Action further alleges that it would have been obvious to use the reduction in

thickness of the reference panel to predict whether the treated blisk is balanced “since the etch rate of the reference panel inherently predicts the amount of material removed from the workpiece, and thus the balance of the blisk.”

The Final Office Action has again improperly combined the teachings of Law with those of Fishter et al., Walker, the alleged APA and Lowe by failing to allege some proper motivation for one skilled in the art to do so. To properly combine the teachings of Blake with those of the alleged APA, Lowe, Walker and Fishter et al., the Final Office Action must allege some proper motivation for one skilled in the art to do so. *See, e.g., In re Fine*, 837 F.2d 1071, 1075, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988) (“teachings of references can be combined only if there is some suggestion or incentive to do so”); *In re Dance*, 160 F.3d 1339, 1343, 48 U.S.P.Q.2d 1635, 1637 (Fed. Cir. 1998) (there must be some motivation, suggestion, or teaching of the desirability of making the specific combination that was made by the applicant). Instead, the Final Office Action alleges no proper “motivation” based on Fishter et al, Walker, the alleged APA, or Lowe for why one skilled in the art would consider the teachings of Law to be relevant.

2. THERE IS NO PROPER MOTIVATION TAUGHT IN LAW FOR COMBINING THE TEACHINGS OF THIS REFERENCE WITH THOSE OF FISHTER ET AL., WALKER, THE ALLEGED APA AND LOWE.

In addition, there is no proper motivation taught in Law for combining the teachings of this reference with those of Fishter et al., Walker, the alleged APA and Lowe according to the method of Claims 8 and 18-20. The Law process is directed at monitoring the etching of a pattern in the electronically conductive layer of a circuit board, rather than monitoring the change in dimensions of the shape of a part. See column 1, lines 12-17. Etching a pattern in the part (according to Law) is also not the same or equivalent to changing the dimensions of the part (according to Claims 8 and 18-20). Law would therefore not teach or suggest the use of such a panel to monitor the degree of change in the dimensions (i.e., the chord and/or thickness) and the degree of hydrogen absorption of blisk blades during chemical milling according to the process of Claims 8 and 18-20 to correct rotational imbalances in such blisks.

3. LAW DOES NOT TEACH USING A REFERENCE PANEL COMPRISING TITANIUM, STEEL, NICKEL, TUNGSTEN OR ALLOYS THEREOF ACCORDING TO CLAIM 19.

Claim 19 defines the reference panel as comprising titanium, steel, nickel, tungsten or an alloy thereof. In rejecting Claim 19, page 7 of the Final Office Action alleges that titanium, steel, nickel, tungsten and alloys thereof are “well known for construction of turbine blades and the like,” referring to Fishter et al., and “would therefore be obvious to use as reference panel metals.” That these metals may be “well known for construction of turbine blades and the like” still fails to address where Law or the other art relied on by the Final Office Action teaches the use of these metals in a reference panel. This allegation in the Final Office Action is simply an unsupported conclusion that is not taught by Law or any of the other art relied on in the Final Office Action.

SUMMARY OF ARGUMENT AND RELIEF REQUESTED


Appellants submit that method of Claims 1-20 is unobvious over the prior art relied on in rejecting these Claims. None of the prior art relied on in the Final Office Action, alone or in combination, teaches or suggests: (1) a process for rotational balancing a blisk by selectively treating the blades thereof with a chemical etchant according to Claims 1 and 9-10; (2) the use of the aqueous etchant solutions of Claims 2-4 and 11-13 in such a selective treatment process for rotationally balancing a blisk; (3) the selective application of a maskant to some of the blisk blades prior to immersion in the etchant solution, especially for the purpose of correcting the rotational imbalance of a blisk, according to Claims 5-7 and 14-16; (4) removing the maskant from the untreated blisk blade(s) and then reimmersing the treated and untreated blades in the etchant solution until the blisk is rotationally balanced according to Claims 7 and 16; (5) immersing solely the treated blade(s) in the etchant solution to achieve rotational balance of the blisk according to Claim 17; or (6) the use of reference panel according to Claims 8 and 18-20 to monitor the degree of change in the chord/thickness of the blisk blade and the degree of hydrogen absorption in such a selective treatment process for rotationally balancing of a blisk.

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In addition, there is no properly alleged motivation for combining the teachings of the references relied on in the Final Office Action in rejecting Claims 1-20.

Accordingly, Appellants respectfully request the Honorable Board of Appeals and Interferences to reverse the Examiner's rejections in the Final Office Action and remand with directions to allow the above application to issue with Claims 1-20 currently pending.

Respectfully submitted,
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CLAIM APPENDIX

1. A method for selective chemical milling of a rotationally imbalanced gas turbine engine blisk having a hub and a plurality of blades made of metal spaced circumferentially around the hub and extending radially outwardly therefrom, each of the blades of the blisk having a leading edge, a trailing edge, a chord defined by a line extending from the leading to the trailing edge, a convex curved surface, a concave curved surface and a thickness defined between the convex and the concave surfaces, the method comprising the step of selectively treating at least one blade of the blisk with a chemical etchant of the metal that the at least one blade is made of for a period of time sufficient to change the at least one of the chord and thickness so that the blisk is rotationally balanced.
2. The method of claim 1 wherein the chemical etchant is an aqueous etchant solution comprising at least one strong acid.
3. The method of claim 2 wherein the strong acid is selected from the group consisting of hydrofluoric acid, nitric acid, hydrochloric acid, sulfuric acid, and mixtures thereof.
4. The method of claim 2 wherein the treating step comprises immersing the at least one blade to be treated in the solution.
5. The method of claim 4 wherein the treating step comprises immersing at least two blades of the blisk in the solution, the at least two blades of the blisk including the at least one blade to be treated with the solution and at least one blade not to be treated with the solution, and which comprises the further step of applying to the surfaces that are potentially in contact with the solution of the at least one blade that is not to be treated with the solution a maskant that is chemically resistant to the solution, the maskant being applied to the surfaces prior to immersion of the at least two blades of the blisk in the solution.

6. The method of claim 5 wherein the maskant is a material selected from the group consisting of plastic films and coatings.

7. The method of claim 5 which further comprises the subsequent steps of removing the maskant from the surfaces of at least one untreated blade and after removal of the maskant, immersing the at least two blades of the blisk in the solution for a period time sufficient to change at least one of the chord and thickness of the at least one blade from which the maskant has been removed, the subsequent steps being repeated until the blisk is rotationally balanced.

8. The method of claim 4 wherein a reference panel made of the same metal as the at least one blade to be treated is immersed in the solution to monitor at least one of the degree of change in the at least one of the chord and thickness and the degree of hydrogen absorption by the metal.

9. A method for rotationally balancing a gas turbine engine blisk that is rotationally imbalanced, the blisk having a hub and a plurality of blades made of metal spaced circumferentially around the hub and extending radially outwardly therefrom, wherein each of the blades of the blisk has a leading edge, a trailing edge, a chord defined by a line extending from the leading to the trailing edge, a convex curved surface, a concave curved surface and a thickness defined between the convex and the concave surfaces, the method comprising the steps of:

- (a) evaluating the rotationally imbalanced blisk to determine the direction and magnitude of the rotational imbalance;
- (b) identifying at least one blade of the rotationally imbalanced blisk for potential treatment with a chemical etchant to correct the rotational imbalance of the blisk;
- (c) determining which of the at least one blade should be treated with the chemical etchant to correct the rotational imbalance of the blisk; and
- (d) selectively treating the determined at least one blade of the blisk with a chemical etchant of the metal that the at least one blade is made of for a

period of time sufficient to change the at least one of the chord and thickness until the blisk is believed to be rotationally balanced.

10. The method of claim 9 which comprises the further steps of:
 - (e) determining after step (d) whether the blisk is rotationally balanced; and
 - (f) if the blisk is determined not to be rotationally balanced after step (e), repeating one or more of steps (a) through (d) until the blisk is rotationally balanced.
11. The method of claim 9 wherein the chemical etchant is an aqueous etchant solution comprising at least one strong acid.
12. The method of claim 11 wherein the strong acid is selected from the group consisting of hydrofluoric acid, nitric acid, hydrochloric acid, sulfuric acid, and mixtures thereof.
13. The method of claim 9 wherein treating step (d) comprises immersing the at least one blade to be treated in the solution.
14. The method of claim 13 wherein treating step (d) comprises immersing at least two blades of the blisk in the solution, the at least two blades of the blisk including the at least one blade to be treated with the solution and at least one blade not to be treated with the solution, and which comprises the further step of applying to the surfaces that are potentially in contact with the solution of the at least one blade that is not to be treated with the solution a maskant that is chemically resistant to the solution, the maskant being applied to the surfaces prior to immersion of the at least two blades of the blisk in the solution.
15. The method of claim 14 wherein the maskant is a material selected from the group consisting of plastic films and coatings.

16. The method of claim 15 wherein treating step (d) further comprises the subsequent steps of removing the maskant from the surfaces of at least one untreated blade and after removal of the maskant, immersing the at least two blades of the blisk in the solution for a period time sufficient to change at least one of the chord and thickness of the at least one blade from which the maskant has been removed, the subsequent steps being repeated until the blisk is rotationally balanced.

17. The method of claim 11 wherein treating step (d) comprises selectively immersing in the solution solely the at least one blade to be treated until the blisk is rotationally balanced.

18. The method of claim 11 wherein a reference panel made of the same metal as the at least one blade to be treated is immersed in the solution to monitor the degree of change in the at least one of the chord and thickness.

19. The method of claim 18 wherein the metal is selected from the group consisting of titanium, steel, nickel, tungsten and alloys thereof.

20. The method of claim 18 wherein the reference panel is reduced in thickness during treating step (d), and wherein the reduction in thickness of the reference panel is used to predict whether the treated blisk is balanced.

EVIDENCE APPENDIX

There is no other “evidence” submitted by Appellants during prosecution that is referred to in this Appeal Brief.

RELATED PROCEEDINGS APPENDIX

There have been no decisions rendered by a court or the Board in any proceedings related to this appeal.